In claim 13, line 5, delete "bis(β-chloroethyl)dichlorosilane".

Please add new claim 21:

--21. (New) The siloxane polymer of claim 1 wherein, in the general formula for the organosilane, R is an ethyl group having at least one but not more that two β-acetoxy substituents.--

REMARKS

Claims 1-21 are presently pending in this application.

Claims 1-20 have been amended to specify the polymer of this invention as a "siloxane" polymer rather than a "silsesquioxane polymer". This amendment is supported by disclosures in the specification as filed for example at page 1, line 10; page 6, line 28, and in examples 6 and 7. Claims 2, 5, and 13 have been amended to remove the β-chloroethyl substituent objected to by the Examiner. New claim 21 designates a specific siloxane polymer, exemplified in Example 9, which is already specified in more general form in claim 2. For these reasons, no new matter has been added by these amendments. In light of these amendments, applicants respectfully request that claims 1-21 be immediately allowed by the Examiner.

Applicants acknowledge the Examiner's comments that claims 3, 4, 6, 7, and 20 would be allowable if rewritten to overcome the § 112 rejection as discussed below and to include all the limitations of the base claim and any intervening claims. The Examiner further states that these claims would be allowable because the prior art fails to provide adequate motivation to include both an α and β substituent group as in the instant claims. Further, there is no prior motivation to specifically utilize a 15% by weight solution of siloxane in diglyme.

Section 112 Rejections

Claims 1-20 have been rejected under 35 U.S.C. § 112, second paragraph as being indefinite. The Examiner argues that when "n" = 2, this silane will not form a silsesquioxane polymer, and questions what applicants intend by the term "silsesquioxane polymer". This rejection is respectfully but strenuously traversed. Nevertheless, in order to advance the prosecution of this application, claims 1-20 have been amended to substitute "siloxane" for "silsesquioxane" in each of the claims. Siloxane polymers are formed from the hydrolysis and condensation reactions of silanes $RSiX_3$ and R_2SiX_2 (R_nSiX_{4-n}, n = 1 or 2) and applicants believe that this amendment clarifies the nature of the polymers in this invention. In light of these amendments, applicants respectfully request withdrawal of the § 112 rejection.

The Examiner has rejected claims 1, 2, 5, 12, 16, and 17 under 35 U.S.C. § 102 (b) as being anticipated by Sommer *et al,* "Organosilicon Compounds V. β-Eliminations Involving Silicon," *J. Amer. Chem. Soc.,* **68**, *1946*, 1083-1085 ("Sommer"). Claims 1, 8, 11, 12, 14, and 16-18 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,923,775 of Schank ("Schank"). The Examiner has also rejected claims 2, 5, 9, 10, 13, and 15 under 35 U.S.C. § 103(a) as being unpatentable over Schank. In addition, claims 1, 2, 5, 9, 11-13, and 15-19 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,666,830 of Alekna ("Alekna"). Applicants traverse the Examiner's various rejections of claims 1, 2, 5, and 8-19 under § 102(b) and § 103(a) and the arguments in support thereof and request reconsideration and withdrawal of the rejections.

Rejections Under § 102(b) Based on Sommer

The Examiner has rejected claims 1, 2, 5, 12, 16 and 17 under § 102(b) as being anticipated by Sommer. The Examiner argues with respect to claims 1, 2, and 5 that Sommer teaches the reaction product of an organosilane meeting the general formula in claim 1 in which X is chlorine, "n" = 1, and R is a β-chloroethyl group. Applicants respectfully traverse this rejection. For a claim to be rejected as anticipated under 35 U.S.C. §102(b), it must be shown that the prior art reference teaches or suggests all of the claimed elements. (M.P.E.P. § 2131).

Independent claim 1 and dependent claims 2, 5, 12, 15, and 17 describe a siloxane polymeric product, useful for preparing SiO_2-rich films, which contains silanol groups. Sommer teaches the synthesis of β-chloroethyl silicone, "a polymer containing a three-dimensional network of Si-O-Si bonds," and the reaction of this polymer with alkali to give ethylene and $Si(OH)_4$. There is nothing in the teachings of Sommer to suggest that the polymer contains any silanol groups, which is a feature of the instant claims. Furthermore, no applications for these polymers are taught by Sommer, and there is nothing in this reference to anticipate the use of siloxanes for the preparation of SiO_2-rich films that are applied to electronic substrates.

With regards to claims 2 and 5, they have been amended so that the β-chloroethyl substituent group has been omitted. As Sommer only teaches a polysiloxane containing this β-chloroethyl group, the grounds for the Examiner's § 102(b) rejections based on Sommer have been removed. Further, there is nothing in Sommer to teach or suggest the use of alternative substituents on the silicon as in the halo- and alkoxy-substituted ethyl and propyl groups in the instant claims.

The Examiner argues that in claim 12, in which the polymer is obtained from the copolymerization of the organosilane with an alkoxysilane, this claim thus encompasses the reaction product of the organosilane with a β-chloroethyl alkoxy silane. Applicants maintain that there is nothing in Sommer to teach the synthesis of a siloxane polymer that is the product of a *copolymerization* of an organosilane with an alkoxysilane, or the benefits of preparing a copolymer product. As described in the specification as filed (page 12, lines 6-23), the purpose of copolymerization is to either reduce or increase the organic component of the reaction product, depending on the ultimate use of the specific polymer. The Examiner's argument that claim 12 includes the polymer prepared by Sommer is inaccurate, as Sommer's product is a *homopolymer*, not a *copolymer*, as in the instant claim. Furthermore, Sommer does not anticipate each of the elements of the instant claim 12, which include that the polymer is a product formed by copolymerization.

For all of the above reasons, Applicants respectfully request that the § 102(b) rejection based on Sommer be reconsidered and withdrawn.

Rejections Under § 102(b) Based on Schank

The Examiner has rejected claims 1, 8, 11, 12, 14, and 16-18 under § 102(b) as being anticipated by Schank. The Examiner argues that Schank teaches a polysiloxane containing an electron-accepting atom, and specifically, asserts that the β-cyanoethyl triethoxysilane taught by Schank will hydrolyze to form the claimed silsesquioxane polymer. Applicants respectfully traverse these rejections. As discussed above, in order to reject a claim under §102(b), the Examiner must show that Schank teaches all of the elements as claimed.

Independent claim 1 and dependent claims 8, 11, 12, 14, and 16-18 teach a siloxane polymer that is useful for making SiO_2-rich films for coating on electronic substrates. Schank teaches a silicone overcoating for electrophotographic imaging members, in which the silicone overcoating comprises a polymerized silane with electron accepting groups on silicon. Schank does not teach or suggest alternative applications of the silicone materials and as such, does not anticipate their use for the preparation of the SiO_2-rich films which is an integral element of the instant claims. If the siloxane polymers of Schank were used to prepare SiO_2-rich films, byproducts would be produced which are not taught by Schank. For example, upon heating the β-cyanoethyl-substituted siloxane of Schank (col. 6, line 32), hydrogen cyanide would be given off as a byproduct. Since Schank does not teach the elimination of hydrogen cyanide, the polymers of Schank must be more thermally stable that the polymers in the claimed invention. Consequently, the siloxanes of Schank would not be useful in preparing SiO_2-rich thin films as the film-forming process requires reaction of the siloxanes at elevated temperature to eliminate the volatile organic groups.

Furthermore, claim 8 specifies a siloxane obtained from the hydrolysis and condensation of a β-substituted ethyltrichlorosilane. Schank teaches silanes of the form X-$(CH_2)_nSi(OR)_3$ (n = 2-4) which are polymerized to form the silicones used for the overcoating layer (column 6, lines 12-19). There is nothing in Schank to suggest the use of a trichlorosilane as in claim 8.

For these reasons, Applicants respectfully request that the § 102(b) rejections based on Schank be reconsidered and withdrawn.

Rejections Under Section 103(a) Based on Schank

The Examiner has rejected claims 2, 5, 9, 10, 13, and 15 under 35 U.S.C. § 103(a) as being unpatentable over Schank. The Examiner acknowledges that Schank does not teach a chloroethyl group as a substituent on the silicon. However, she argues that both chloromethyl and chloropropyl groups are taught, and that one skilled in the art would have found the selection of the chloroethyl substituent obvious in light of the teaching of Schank. The Examiner also argues that the silanol content of at least 33.3% taught by Schank renders the silanol content within the claimed ranges obvious. Finally, she contends that Schank teaches the addition of various silanes in the hydrolysis product. Applicants strenuously but respectfully traverse the Section 103(a) rejection based on Schank.

In order to establish *prima facie* obviousness, the Examiner must make all of the following showings: (1) there must be some suggestion or motivation to modify the reference as suggested by the Examiner (it is not sufficient to say that the cited reference can be modified without a teaching in the prior art to suggest the desirability of the modification); (2) there must also be a reasonable expectation of success; and (3) the reference must teach or suggest all limitations of the claims. The teaching or suggestion to combine or modify the applied art and the reasonable expectation of success must both be found in the prior art and not in Applicant's specification. (M.P.E.P § 2143).

A *prima facie* case of obviousness has not been established in the present case. Firstly, with regards to claims 2 and 5, these claims have been amended to omit the chlorine substituent on the ethyl group, that is, the β-chloroethyl substituent. As such, there is no further basis for the Examiner's rejection of these claims.

Second, the polymeric products disclosed in instant claims 9, 10, 13, and 15 are useful for making SiO_2-rich films for coatings in electronic devices. The siloxanes disclosed by Schank are used as coating for electrophotographic imaging; specifically, the coatings are particularly useful for not degrading under various harsh cycling conditions. There is nothing in the teaching of Schank to suggest that it would be obvious to modify the siloxane coatings to produce thin films for use in microelectronic devices as in Applicants' claimed invention. As discussed above, Schank does not teach or suggest the elimination of hydrogen cyanide, which would be a byproduct resulting from the heating of such polymers as in the claimed invention. Consequently, the siloxanes of Schank are more thermally stable than the presently claimed siloxanes and there is nothing in Schank to suggest modifying the polymers to give thermal reactions at elevated temperatures.

In addition, the siloxanes of Schank are designed for use as coatings in electrophotographic imaging, which require the presence of organic moieties on the polymers. Conversely, in the present invention, the SiO_2-rich films are formed by eliminating the volatile organic groups, as taught in the specification at least at page 10, line 26 to page 11, line 4. The siloxane polymers of the present invention were specially designed to have volatile organic groups which can be eliminated upon heating, resulting in SiO_2-rich films which have application in the electronics industry. Not only were the siloxanes of Schank not designed for such a purpose, they were designed to retain the organic groups for use in electrophotographic coatings.

Furthermore, even if one were motivated to utilize the electrophotographic imaging coatings in the microelectronics art, there is no reasonable expectation of success. For

these reasons, Schank fails to establish *prima facie* obviousness of Applicant's claimed invention.

In addition, the Examiner has argued that Schank teaches a silanol content of at least 33.3% (column 5, lines 10-15). Schank teaches a polymerized silane comprising a reaction product of a hydrolyzed alkoxysilane and a cross-linkable siloxanol-colloidal silica hybrid material having at least one silicon-bonded hydroxyl group per every three -SiO- units. Schank *does not teach* the silanol content in the polymerized silane product. Furthermore, there is nothing in Schank to suggest an ideal silanol content in the polymers as in the instant claims 9 and 10.

Finally, the polymeric product in claim 15 is specifically obtained from copolymerization of the organosilane with an organotrichlorosilane. The siloxanes taught by Schank are prepared from the hydrolysis/condensation of *trialkoxysilanes* as shown in column 6, lines 12-19. There is nothing in Schank to suggest the use of trichlorosilanes in the synthesis of these materials.

For all these reasons, Schank fails to establish *prima facie* obviousness over the current claims. In light of these arguments, reconsideration and withdrawal of the Section 103 rejections of Applicants' claimed invention over Schank are respectfully requested.

Rejections Under Section103(a) Based on Alekna

The Examiner has rejected claims 1, 2, 5, 9, 11-13, and 15-19 under 35 U.S.C. § 103 (a) as being unpatentable over Alekna. The Examiner argues that one of ordinary skill in the art would be motivated by the teachings of Alekna concerning siloxane resins to include units

such as β-chloroethyl. Furthermore, she argues that the copolymerizations in the instant claims are also suggested by the teachings of Alekna, and that the silanol contents taught by Alekna are within the range of claim 9. Applicants strenuously but respectfully traverse these § 103(a) rejections.

As described above, the Examiner must make three showings in order to establish *prima facie* obviousness. A *prima facie* case has not been established in the present situation.

First, with regard to claims 2 and 5 as discussed above, the β-chloroethyl group which is the basis for the Examiner's rejection has been removed by this amendment.

With regard to the remaining claims in the rejection, Alekna does not suggest a siloxane polymer of Applicant's claimed invention, that is, a polymeric reaction product, useful for preparing SiO_2-rich thin films, obtained from the hydrolysis/condensation of an organosilane containing a β-substituted alkyl group. Alekna describes two-component resin molding compounds in which the first component is an uncured silicone resin (containing at least 0.25% of silicon-bonded hydroxyl groups or lower alkoxy groups) and the second component is (i) a silane or siloxane containing silanol groups or alkoxy groups and (ii) a lead-based catalyst (column 1, lines 39-70). Alekna's two-component molding resins in no manner suggest Applicants' siloxane polymer or the intended use thereof.

Specifically, the siloxane resins taught by Alekna are important because they possess good thermal stability at elevated temperatures. For example, Alekna discloses that "the resin can be refluxed 2 to 3 hours at temperatures between 190 °C to 230 °C, to further improve the characteristics of the resin" (column 5, lines 55-57). These teachings clearly describe the desirability of a silicone molding resin that does not undergo significant reaction at elevated

temperatures and as such do not motivate someone of ordinary skill in the art to prepare Applicants' claimed siloxane polymers, which have been specially designed to undergo reaction at elevated temperatures. As discussed in the Specification, pages 10-11, "When the β-substituted silsesquioxane polymers are reacted further, either by heating at moderate temperature...the labile β-substituted alkyl groups are substantially volatilized and the silsesquioxane polymer is converted to a SiO_2-rich ceramic material, suitable for preparing thin films or layers on electronic substrates".

There is nothing in Alekna to suggest the modification of the siloxane resins to give the desired and observed thermal reactivity in the present invention, that is, to be thermally unstable so as to evolve volatile materials upon heating. As such, Alekna fails to establish *prima facie* obviousness of Applicant's claimed invention. Reconsideration and withdrawal of the Section 103 rejections of Applicants' claimed invention over Alekna are respectfully requested.

In view of the foregoing amendments and remarks, it is respectfully submitted that the claims are patentable, distinct from the prior art of record, and in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

BARRY ARKLES, *et al.*

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